

REMARKS

The claims remaining in the present application are Claims 1-8. Claims 1, 3, 4, 6, and 7 have been amended. No new matter has been added as a result of claim amendments.

CLAIM OBJECTIONS

Claims 1, 3, 4, and 6 are objected to for a formality. Claims 1, 3, 4, and 6 have been currently amended to correct the informality. Applicants respectfully request that the objection be removed.

CLAIM REJECTIONS

35 U.S.C. §112

Claims 7 and 8 are rejected under 35 U.S.C §112, ¶2. Claim 7 has been amended to change "the tree" to "a tree." It is respectfully submitted that currently amended Claim 7 complies with 35 U.S.C. §112, ¶2. Applicants assume Claim 8 was rejected under 35 U.S.C §112, ¶2 solely because it depends from Claim 7. Because Claim 7 is believed to comply with 35 U.S.C §112, ¶2, it is respectfully believed that Claim 8 complies with 35 U.S.C §112, ¶2.

35 U.S.C. §102

Claims 1-8 are rejected under 35 U.S.C. §102 as being anticipated by Lei et al., U.S. Pat. No. 6,356,665 (hereinafter, Lei). The rejection is respectfully traversed.

Currently amended Claim 1 recites:

A method of coding the bit-planes of an array of numbers comprising the steps of:
 converting the values in the array of numbers to binary;
 determining the number of bit-planes based on a number having the maximum absolute value of the array of numbers;
 generating a tree structured description of significance information for each bit-plane of the array based on a modified quad-tree coding technique;
 generating an SNR scalable encoding of the significance information for each bit-plane by describing new branches and leaves of the tree structured description corresponding to each bit-plane in a bottom-up-depth-first manner;
 generating an encoding of refinement information for each bit-plane;
and
 generating a SNR scalable description of the array by concatenating the encoding of the significance information and the refinement information generated for each bit-plane.

Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, *arranged as in the claim* (Lindemann Maschinefabrik GmbH v. American Hoist & Derrick Co., 221 USPQ 481, 485 (Fed. Cir. 1984)(emphasis added)). Lei fails to disclose each and every element of Claim 1, arranged as in the claim.

Claim 1 recites that the encoding of the significance information and the refinement information generated are concatenated for each bit-plane. For example, Figures 5C, 6C, 7C, and 8C show significance information, Δ_s , concatenated with refinement information, R_s .

Lei fails to disclose concatenating significance information and refinement information, for each bit-plane, as claimed. In contrast, Lei mixes refinement information with significance information. For example, in Figure 6B of Lei, bitstream 152 clearly shows a refinement bit (r) mixed in with the significance information. Moreover, bitstream 154 clearly shows several refinement bits (r) mixed in with the significance information. Therefore, Lei fails to disclose “concatenating significance information and refinement information, for each bit-plane,” as claimed.

Claim 1 also recites that significance information is generated for each bit-plane by describing new branches and leaves of the tree structured description in a bottom-up-depth-first manner. Lei fails to teach using a bottom-up-depth-first manner to generate significance information for each bit-plane, as claimed. The Specification at page 14, line 18 et seq. describes an embodiment for a bottom-up-depth-first manner for generating the encoding of significance information for the second highest bit-plane. The procedure is similar for other bit-planes. Referring to page 14, lines 22-23 and Figure 6B, the order for encoding is nodes 46, 48, 50, 68, 70, 74, 38, 52, 54, 56, 58, 40, 30, 32, 34, for this embodiment. In this case, the description is left to right, although right to left could be performed instead. Thus, nodes at a lower level in the tree (e.g., nodes 46-50 and 68, 70, 74) are encoded into the bitstream before nodes at a higher level (e.g. node 38). In this embodiment, the children of node 38 (nodes 52-58) are encoded after node 38. Thus, one embodiment for a bottom-up-depth-first manner is described.

Applicants do not understand Lei's description of constructing the bitstream to be a bottom-up-depth-first manner, as claimed. Lei refers to a concept of root blocks and sub-blocks. Referring to Figure 6B of Lei, each bit-

plane comprises four root blocks, each having four sub-blocks. Were this information described as a tree, each root block would have four child nodes. Lei encodes into the bitstream a root-block at a time, using a top-down approach. This is most evident when examining the bitstream formed from the second least significant bit-plane in Figure 6B of Lei (bitstream 152). For convenience, Applicants will refer to sub-blocks using the (x, y) coordinate system shown in Figure 6B. Further, if the coordinate is preceded by an "r" it indicates that it is a reference bit. Root blocks will be referred to as RB1-RB4. RB1 comprises the four sub-blocks near the origin, RB2 comprises the four sub-blocks to the right of RB1 (higher x coordinates). RB3 comprises the four sub-blocks with higher y-coordinate range than RB1, but the same x-coordinate range. (Note that root block RB1 is not described in the bitstream 152). Using this notation, the order for bitstream 152 is: r(1,1), r(2,1), r(1, 2), r(2, 2), RB2, (3, 1), (4,1), (3, 2), (4, 2), r(1, 3) (2,3), (1, 4), (2, 4), RB4, (3, 3), (4, 3), (3, 4), (4, 4). This is not a bottom-up-depth-first manner, as claimed. In contrast, it is a top-down approach in which a higher level of the tree (root blocks) are encoded before the lower level of the tree is encoded (sub-blocks).

In contrast, a bottom up approach would start at lower leaves. For example, a bottom-up-depth-first might start the bitstream with cells (2, 3), (1,4), (2, 4). That is, cells at the lowest level are described first in a bottom-up-depth-first approach. For the foregoing rationale, Lei fails to disclose "generating an SNR scalable encoding of the significance information for each bit-plane by describing new branches and leaves of the tree structured description corresponding to each bit-plane in a bottom-up-depth-first manner", as claimed. Therefore, Lei does not anticipate Claim 1.

For the foregoing rationale, Claim 1 is not anticipated by Lei. Therefore, allowance of Claim 1 is, respectfully submitted.

Independent Claims 3, 4, 6, and 7 recite similar limitations as Claim 1. For the rationale discussed in the response to Claim 1, it is respectfully submitted that Claims 3, 4, 6, and 7 are not anticipated by Lei. Therefore, allowance of Claims 3, 4, 6, and 7 is respectfully submitted.

Claims 2, 5, and 8 depend from Claims 1, 4, and 7, which are believed to be allowable for the reasons discussed herein. As such, allowance of these claims is earnestly requested.

CONCLUSION

In light of the above listed amendments and remarks, reconsideration of the rejected claims is requested. Based on the arguments and amendments presented above, it is respectfully submitted that Claims 1-8 overcome the rejections of record. Therefore, allowance of Claims 1-8 is respectfully solicited. A clean version of the currently amended Claims is attached to this response entitled, "Clean Version of the Currently Amended Claims".

Should the Examiner have a question regarding the instant amendment and response, the Applicants invite the Examiner to contact the Applicants' undersigned representative at the below listed telephone number.

Respectfully submitted,
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CLEAN VERSION OF THE CURRENTLY AMENDED CLAIMS

Q1 1. (Currently Amended) A method of coding the bit-planes of an array of numbers comprising the steps of:
converting the values in the array of numbers to binary;
determining the number of bit-planes based on a number having the maximum absolute value of the array of numbers;
generating a tree structured description of significance information for each bit-plane of the array based on a modified quad-tree coding technique;
generating an SNR scalable encoding of the significance information for each bit-plane by describing new branches and leaves of the tree structured description corresponding to each bit-plane in a bottom-up-depth-first manner;
generating an encoding of refinement information for each bit-plane; and
generating a SNR scalable description of the array by concatenating the encoding of the significance information and the refinement information generated for each bit-plane.

A2 3. (Currently Amended) A method of coding the bit-planes of an array of numbers, wherein the values in the array of numbers have been converted to binary, the binary values have been truncated to a predetermined level of accuracy, and the number of bit-planes has been determined based on a number having the maximum absolute value of the array of numbers, the method comprising the steps of:
generating a tree structured description of significance information for each bit-plane of the array based on a modified quad-tree coding technique;
generating an SNR scalable encoding of the significance information for each bit-plane by describing new branches and leaves of the tree structured description corresponding to each bit-plane in a bottom-up-depth-first manner;
generating an encoding of refinement information for each bit-plane; and
generating a SNR scalable description of the array by concatenating the encoding of the significance information and the refinement information generated for each bit-plane.

4. (Currently Amended) An apparatus for coding the bit-planes of an array of numbers comprising:
means for converting the values in the array of numbers to binary;
means for truncating the binary values to a predetermined level of accuracy;

means for determining the number of bit-planes based on a number having the maximum absolute value of the array of numbers;

means for generating a tree structured description of significance information for each bit-plane of the array based on a modified quad-tree coding technique;

means for generating an SNR scalable encoding of the significance information for each bit-plane by describing new branches and leaves of the tree structured description corresponding to each bit-plane in a bottom-up-depth-first manner;

means for generating an encoding of refinement information for each bit-plane; and

means for generating a SNR scalable description of the array by concatenating the encoding of the significance information and the refinement information generated for each bit-plane.

6. (Currently Amended) A apparatus for coding the bit-planes of an array of numbers, wherein the values in the array of numbers have been converted to binary, the binary values have been truncated to a predetermined level of accuracy, and the number of bit-planes has been determined based on a number having the maximum absolute value of the array of numbers, the apparatus comprising:

means for generating a tree structured description of significance information for each bit-plane of the array based on a modified quad-tree coding technique;

means for generating an SNR scalable encoding of the significance information for each bit-plane by describing new branches and leaves of the tree structured description corresponding to each bit-plane in a bottom-up-depth-first manner;

means for generating an encoding of refinement information for each bit-plane; and

means for generating a SNR scalable description of the array by concatenating the encoding of the significance information and the refinement information generated for each bit-plane.

7. (Currently Amended) A computer coding system for an input image, the system having a sampling filter which decomposes the input image into four frequency subbands and outputs a Wavelet transform, the system comprising:

an encoder which generates a SNR scalable description of the Wavelet transform by concatenating an encoding of significance information and an

encoding of refinement information generated for each bit-plane, wherein the encoding of the significance information for each bit-plane is generated by describing new branches and leaves of a tree corresponding to each bit-plane in a bottom-up-depth-first manner.